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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,790	02/16/2005	Rainer Malzkorn	264847US0X PCT	8725

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EXAMINER	
BULLOCK, IN SUK C	

ART UNIT	PAPER NUMBER
1797	

NOTIFICATION DATE	DELIVERY MODE
01/29/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/524,790	MALZKORN ET AL.	
	Examiner	Art Unit	
	In Suk Bullock	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 February 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/16/05, 4/19/05, 9/5/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

ETAILED ACTION

The disclosure is objected to because of the following informalities: a brief description of figures is missing from the specification.

Appropriate correction is required.

Claim Objections

Claim 1 is objected to because of the following informalities: the dissociation step (c) is missing a catalyst (although the preamble of the claim recites "acid-catalyzed dissociation", the process step must include the catalyst to receive a patentable weight). Also, in step (d) of the claim the term "dissociating" should be changed to "separating".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 9 and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The recitation, "the separation of the isobutene in step d) from the MTBE present in fraction a)", is indefinite because there is no such separation recited in claim 1. It appears that the claim is directed to employing reactive distillation

column to concurrently carry out the dissociation step a) and separation step d). This is the interpretation which will be relied upon by the examiner in addressing these claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a

later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-8 and 10-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,567,860 to Mowry et al. (hereinafter "Mowry").

Mowry discloses a process for producing high purity isobutene by decomposition of methyl tert-butyl ether (MTBE) (abstract). The process comprises: taking a feed stream obtained from etherification zone comprising MTBE, C_4 hydrocarbons, C_4 oligomers, dimethyl ether (DME), and methanol (col. 8, lines 60-66 and col. 10, lines 7-9) and

(a) sending said feed stream to an first separation zone to obtain an overhead stream comprising C_4 hydrocarbons, methanol, and DME, a bottoms stream comprising C_4 oligomers, and a sidecut stream comprising MTBE and MSBE (col. 9, lines 15-24 and col. 10, lines 10-20);

(b) sending the sidecut stream to a decomposition reactor containing an acidic decomposition catalyst to decompose MTBE to produce a decomposition effluent stream comprising isobutene, MTBE, MSBE, methanol, DME, and n-butene (col. 5, lines 11-25; col. 9, lines 25-27; and col. 10, lines 18-29);

(c) sending the decomposition effluent stream to a second separation zone to obtain an overhead stream comprising isobutene, n-butene, methanol, and DME and a bottoms stream comprising methanol, MTBE, and MSBE (col. 9, lines 28-32 and col. 10, lines 29-36);

(d) sending the bottoms stream to a third separation zone to obtain an overhead stream comprising MTBE, MSBE, and methanol and a bottoms stream comprising MTBE and methanol and recycling the bottoms stream to the first separation zone (col. 9, lines 32-46 and col. 10, lines 36-45).

Mowry further discloses water-washing the overhead stream from the second separation zone and passing the water-washed isobutene-containing stream to a stripper column to recover a bottom stream containing isobutene and an overhead stream comprising DME (col. 10, lines 30-33 and col. 11, lines 4-20). In addition to the specifically noted columns and lines teachings, see the sole figure in the reference.

It is noted that the present claimed feed mixture includes C_5-hydrocarbons and TBA whereas Mowry is silent. However, since the feed mixture in Mowry is from an etherification process (a reaction between C_4-hydrocarbon mixture comprising isobutene and methanol), the feed mixture would have inherently contained C_5-hydrocarbons and TBA in addition to those explicitly disclosed by Mowry. It is known to those skilled in the art that TBA would separate out with the high boilers and C_5-hydrocarbons will separate out with the low boilers. Thus, Mowry's overhead stream and bottoms stream compositions from the first separation zone would encompass the claimed fractions (a) and (b) compositions as recited in present claim 1.

Mowry fails to disclose recirculating the bottoms stream from the second separation zone to the feed mixture as claimed in step 1(d).

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Mowry by omitting the additional separation step (third separation zone in Mowry) and sending the bottoms stream from the second separation zone to the first separation zone in order to increase the production of effluents from the first separation zone which subsequently goes into the decomposition reactor and thereby increase the production of the required product, i.e., isobutene, and further avoids the additional separation step which would reduce costs.

With regard to claimed separation of C_4 oligomer, MSBE and TBA from fraction a) by means of distillation or by means of a bleed stream as called for in claims 2 and 3, Mowry discloses that C_4 oligomers may be recovered from the first separation zone by means of at least one distillation column (col. 9, lines 18-24). It would have been obvious to those skilled in the art to use any effective separation means including the claimed means of a bleed stream to remove C_4 oligomers from fraction a). Further, it is noted Mowry recovers three separate streams from the first separation zone whereas the present claimed invention calls for a separate step of removing C_4 oligomers from MTBE prior to MTBE entering the decomposition reactor. It has been held the splitting of one step into two, where the processes are substantially identical or equivalent in terms of function, manner and result, does not patentably distinguish the processes. *Ex parte Rubin*, 128 USPQ 440 (Bd. Pat. App. 1959).

With regard to the claimed top product from the purification column comprises isobutene and volatile by-products, Mowry discloses a top product

comprising DME and is silent with regard to isobutene. It is known to those skilled in the art that no separation is 100% pure and, therefore, it would have been expected that the top product from the stripper column in Mowry would have contained some level of isobutene.

With regard to the claimed removal of water in the isobutene-containing stream by means of a decanter located at either in the top section of the purification column or at side offtake of the purification column, it is first acknowledged that Mowry is silent with regard to using a decanter to remove water from the isobutene-containing stream. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Mowry by removing water using any means including employment of the claimed decanter because removal of water prior to the purification step to recover isobutene would reduce load on the distillation/separation column and, thereby, reduce costs (smaller distillation column, less number of trays, lower energy consumption). Also, use of a decanter is the cheapest means since no energy is needed to separate water from isobutene which is immiscible. Second, it is known to those skilled in the art that where the decanter is placed is dependent upon the physical condition of the feed entering the purification column. If the feed is a mixture of liquid and gas, then the decanter would be placed at side offtake of the purification column whereas if the feed is in a liquid state then the decanter would be placed in the top section of the purification column.

Claims 9 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,567,860 to Mowry (hereinafter "Mowry") as applied to claims 1-8 and 10-19 above, and further in view of U.S. Patent 5,095,164 to Gabel et al. (hereinafter "Gabel").

The teachings of Mowry are as discussed above.

Mowry fails to disclose employing a reactive distillation column to concurrently conduct decomposition of MTBE and separation of the decomposition effluent.

Gabel discloses cleaving MTBE to produce isobutene using a reactive distillation column (col. 1, lines 13-28).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Mowry and employed a reactive distillation column for concurrent dissociation of MTBE and separation of desired isobutene product as taught by Gabel because Gabel has taught that the employment of a reactive distillation column for the dissociation of MTBE permits rapid removal of isobutene so that secondary reactions are suppressed and greater control/accuracy in the reaction temperature (col. 3, lines 36-52).

Citation of Pertinent Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent 5,518,699 discloses a process for cleaving MTBE using a reactive distillation column.

U.S. Patent 4,570,026 discloses a process for dissociation of MTBE with high selectivity of isobutene.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to In Suk Bullock whose telephone number is 571-272-5954. The examiner can normally be reached on Monday - Friday 6:00-2:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

In Suk Bullock

I.B.